1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction to Phase II Planning

This Technical Assessment report summarizes the technical components of the Watershed Assessment for Water Resource Inventory Area 20 (WRIA 20). The technical components are intended to provide baseline information for development of management strategies in the Phase III Watershed Plan. The Watershed Management Act identifies one required element (water quantity) and three optional elements (instream flow, water quality, and habitat) of watershed planning. Based on direction of the WRIA 20 Planning Unit, this Technical Assessment includes the Water Quantity required element, as well as assessments of Water Quality and Habitat. The Instream Flow element will be included in the Phase III WRIA 20 Plan, to be produced in Fall 2005. Some background instream flow information is also included in this Technical Assessment.

The Water Quantity element of this assessment was conducted by Golder Associates Inc. (Golder), and includes a groundwater resources and geology, water allocation, water use, water balance, and land use component. Each of these components were presented to the WRIA 20 Planning Unit as draft Technical Memoranda for their review and comment. Each of the technical memoranda were revised, based on Planning Unit comments, and incorporated as Sections 2 through 5 of this report.

The Water Quality and Habitat elements for WRIA 20 were provided by the Olympic Natural Resources Center (ONRC), and are presented in their entirety in the *WRIA 20 Technical Assessment Level 1* (Hook, 2004). Relevant portions of the water quality and habitat assessments are incorporated into this Technical Assessment Report as Sections 7 and 9.

The Bureau of Reclamation (BOR) provided estimates of streamflow for all sub-basins within WRIA 20 with the exception of Sooes and Ozette. A report from BOR detailing the methodology for estimating streamflows is forthcoming and will be included as an appendix to this report. Streamflow data from BOR were used in the water balance (Section 5). Exceedance curves for five of the seven major sub-basins in WRIA 20 are also presented in Section 5.

This Technical Assessment Report contains specific elements that are intended to fulfill the requirements of RCW 90.82 for Watershed Planning, as summarized below.

Section	**Requirements**
Section 2.0 Groundwater Resources and Geology	RCW 90.82.070 (1a)(1b)(1f)(1g)
Section 3.0 Water Allocation	RCW 90.82.070 (1c)
Section 4.0 Water Use	RCW 90.82.070 (1d)(1e)
Section 5.0 Water Balance (Including exceedances curves for streams in the Watershed)	RCW 90.82.070 (1a)(1b)(1g)
Section 7.0 Fish Habitat & Distribution Section 8.0 Fish Plans and Policies	RCW 90.82.100
Section 9.0 Water Quality	RCW 90.82.090

1.2 Watershed Summary

The text of Section 1.2 is excerpted from the document written by Abigail Hook, submitted to the WRIA 20 Planning Unit on June 10, 2004 with minor changes made by the Planning Unit.

The 735,000 acre watersheds designated "WRIA 20" by the Washington Department of Ecology (Ecology) includes all rivers and streams that drain into the Pacific Ocean from Cape Flattery to Huelsdonk Ridge on the south side of the Hoh valley (Figure 1-1). The northern portion of the watershed lies within Clallam County, the slightly smaller southern portion within Jefferson County. The watershed includes the Usual and Accustomed Fishing Grounds and Stations for three Western Washington treaty tribes: the Makah, the Hoh and the Quileute Tribes. This watershed generally is characterized by streams that have headwaters in the Olympic Mountains upwards of 6000 feet in elevation and drain into lowland valleys. The largest basin in the WRIA is the Quillayute with four major sub-basins: the Dickey, Calawah, Bogachiel and Sol Duc. Other basins in the WRIA include the Hoh, Ozette, Waatch and Sooes as well as several independent streams that do not drain from the higher elevations of the Olympic Mountain core. Within the WRIA, there are 569 streams and 1,355 stream miles (Hook, 2004) with three major lakes, Ozette Lake (Ozette sub-basin), Lake Dickey (Dickey sub-basin) and Lake Pleasant (Quillayute – Sol Duc sub-basin). Annual rainfall in the basin is the highest in Washington State with an average of 80 inches near the coast to 240 inches in the Olympic Mountains. Streams flowing from much of the coastal lowlands are rain dominated while higher elevation streams are rain-on-snow dominated (i.e., mix of rain and snowfall). Several of the sub-basins on the eastern edge of the WRIA are glacially fed. The WRIA is often exposed to high winds and heavy rainstorms, which affect both vegetation and hydrology.

Undisturbed areas in WRIA 20 are naturally dominated by Sitka spruce (*Pincea sitchensis*) and western hemlock (*Tsuga heterophylla*) in the lowlands with silver fir (*Abies amabilis*) at higher elevations. Early successional species and riparian species often include hardwoods such as bigleaf maple (*Acer macrophyllum*) and red alder (*Alnus rubra*). Old growth stands are generally open canopied conifers; trees can reach up to 200 feet in height. As a result of logging and disturbance since the 1940s, much of the riparian tree diversity, size and abundance had been altered.

1.2.1 History

Before white settlement, the Quileute, Hoh, Ozette and Makah Tribes inhabited many areas of WRIA 20 in their numerous villages inhabited and used most of the land for hunting, fishing and gathering. The tribes today are on four separate reservations. However, the Ozette Reservation is under the treaty jurisdiction of the Makah Tribe and is currently managed for wilderness. All the tribes continue to use natural resources within their usual and accustomed places for sustenance, ceremonies, and commercial fishing. Many of the rivers are sites of ceremonial and cultural importance.

White settlement began in the mid 1800s in the Ozette, Sol Duc, Dickey, Calawah and Bogachiel watersheds. Much of the initial settlement was located on the Forks prairie where topography was conducive to farming. Both natives and early settlers used fire to clear the way for homesteads, farming and primitive roads. With the arrival of the railroad in the 1920s, commercial timber harvesting swept across the area and billions of board feet were exported. Extensive road networks accompanied the logging efforts except in Olympic National Park (protected as a National Park in 1938), which has remained relatively undisturbed. Logging continued through the 1980s but has slowed in scale and economic growth due to world timber markets, corporate agglomeration, and state and federal legislation.

1.2.2 Land Management

Limited riparian protection began in the 1970s and buffers of 50 feet were required on type I and II streams (i.e., large fish bearing streams). By 1982, streamside buffers of 50 feet were to be left on all non-federal fish bearing streams (i.e., type I to III). In 1990, a 200 feet minimum disturbance buffer with no clearcutting within 100 feet of Type I and II steams was required on national forest lands. In 1994, The Northwest Forest Plan was instituted in the Olympic National Forest. This plan has halted commercial harvests on federal land within the WRIA with the exception of occasional commercial thinning sales.

The Washington State Department of Natural Resources manages Trust Lands of the State and Clallam County under a Habitat Conservation Plan (HCP). The HCP was negotiated with the federal agencies that regulate DNR's timber harvest and associated impacts for species that are or could conceivably come under Endangered Species Act (ESA) protection. The Trust Lands are also subject to state regulation of timber harvest and other activities under the Washington Forest Practices Act and Shoreline Management Act. Private timberland is also regulated under the Forest Practices Act and Shoreline Management Act. The Forest Practices Act now also includes provisions a regulatory HCP, which were negotiated among federal, state, tribal and industry representatives. Provisions of this HCP have been determined to meet requirements of the federal Clean Water Act. Treaty tribes participate in implementation of the Washington Forest Practice Act through significant planning, restoration, and implementation assistance (the role of the Tribes in land management activities in WRIA 20 is discussed below in Section 1.3.1). Under DNR regulations, tribal technical personnel are part of the "ID Team," with landowners and other applicable state agencies, when harvests are proposed.

With the slow down of timber harvest and an increase of urban centers in Washington State, the Olympic Peninsula communities have promoted the area as a destination for recreation in order to boost economic development. The undeveloped nature of the basins combine with abundant resources to make the area a natural choice for activities including hiking, sport fishing, biking, camping, and driving for pleasure. There has been little impact from these activities outside heavily used campsites, occasional heavy sport fishing, and mainstem river access points but as use increases, impacts from recreation will most likely increase.

1.2.3 Dominant Processes

Winds off of the Pacific Ocean have a major effect on WRIA 20. The most famous historical event occurred in 1921 when more than 8 billion board feet were toppled in a single storm. Between 20% and 40% of the stands in the Dickey sub-basin alone were blown down. Patterns in most watersheds in WRIA 20 suggest that the wind disturbance is frequent with return intervals averaging around 20 years. In the Hoh watershed, winds exceeding 100 mph disturb southern exposure slopes on the same return interval. As a result of the wind, across the watershed, the largest canopied trees are often in protected draws.

Fire is one of the dominant processes on the western portion of the Olympic Peninsula. Prehistorically, the fire regime was one of infrequent, very large, very intense events, which cleared entire stands (around 1 million acres) about every 200 years. A major fire is thought to have occurred in 1708, traveling from the east portion of the WRIA westward to the Pacific. The 1951 Forks Fire was the last major fire.

The historic fire regime includes most notably the Great Forks Fire of 1951. The fire began as a result of a clearing effort for the Port Angeles-Western railroad in the Sol Duc watershed. Within 8 hours, the fire burned 33,000 acres through the North Fork Calawah watersheds, and the northwestern

portion of the Sitkum and South Fork Calawah watershed according to the 1998 North Fork Calawah Watershed Analysis. Though the fire "damaged" a large area, subsequent management practices worsened conditions. Within five or six years, the entire burn area had been roaded and salvaged logged, leading to a greater potential for mass wasting events and surface erosion.

Upper reaches of sub-basins on the western edge of the Olympic Mountains often have steep slopes with a surface layer of glacial till. This combination makes mass wasting a common natural event in the mountainous portions of the WRIA. Forest roads and clearcutting have accelerated mass wasting rates within WRIA 20. Lack of road maintenance activity associated with the implementation of the U.S. Department of Agriculture (USDA) Northwest Forest Plan has contributed directly to mass wasting as well on federal lands.

1.3 Tribal Management

Western Washington treaty tribes (the Makah, Hoh, and Quileute in WRIA 20) have unique treaties that reserve off-reservation rights to fish in "Usual and Accustomed Fishing Grounds and Stations," often abbreviated as "U&A." The drainage basins in WRIA 20 for treaty tribes are initially described in *United States v. Washington,* 384 F. Supp. 312 (W.D. Wash. 1974), although some refinements may appear in the sub-proceedings of this ongoing case or other federal decisions. *United States v. Washington* sets forth the tribal ownership of the fishery as 50-50 with the non-Indians for each U&A, and also qualifies the tribes as co-managers of the fishery within their respective U&A. Because of tribal shared ownership of the fish, and co-management with fisheries managers such as WDFW and USFWS, they have a major role in fish habitat management, which includes the waters which are the subject of this process. Every part of WRIA 20 addressed by this state watershed process (RCW 90.82) lies within at least one of the three tribes' U&A and in some cases, there is overlap.

1.4 Sub-Basin Descriptions

The text of Section 1.4 is excerpted from the document written by Abigail Hook, submitted to the WRIA 20 Planning Unit on June 10, 2004 with minor changes made by the Planning Unit.

For the purpose of this report, and the Phase III Watershed Management Plan, the watershed has been divided into the following sub-basins. These sub-basins are shown on Figure 1-1.

1.4.1 Hoh Sub-Basin

The Hoh watershed lies along the most southern edge of WRIA 20. The river system is fed by several glaciers on Mt Olympus and flows westward for approximately 60 miles to the Pacific Ocean, draining 299 square miles along the way.

1.4.2 Ozette Sub-Basin

The Ozette watershed is dominated by Lake Ozette, the third largest natural lake in the State of Washington. While the lake is large (11.4 square miles), the actual watershed is relatively small at 77 square miles. The total drainage area of the Ozette watershed at the confluence with the Pacific Ocean is 88.4 square miles. Several large, low elevation, low gradient streams drain into Lake Ozette, which empties through the Ozette River into the Pacific Ocean. With the exception of some headwaters and tributaries, the watershed is generally characterized by gentle topography with a maximum elevation of 1900 feet.

1.4.3 Quillayute Sub-Basins

The Quillayute drainage system consists of the 5.5-mile Quillayute mainstem, and the Bogachiel, Calawah, Dickey, and Sol Duc Rivers, which collectively become the Quillayute River at the Sol Duc/Bogachiel River confluence. The sub-basin in total drains 628 square miles into the Pacific Ocean (Fretwell, 1984). There is very little information on the Quillayute River mainstem. The entire area between the reservation boundary and the confluence with the Sol Duc and Bogachiel can be considered a data gap for both fish habitat and water quality.

1.4.3.1 Bogachiel Sub-Basin

The Bogachiel River is formed by the North Fork and South Fork Bogachiel Rivers that drain from the steep headwaters of the Olympic Mountains. Technically, the entire Calawah River is a tributary to the Bogachiel, but because of the size of the drainage, it is generally treated separately. The upper reaches of the Bogachiel River lie within the Olympic National Park while the middle and lower reaches are used primarily for timber production and farming. There is little information on the hydrology of the Bogachiel basin.

1.4.3.2 Calawah Sub-Basin

The South Fork Calawah and Sitkum Rivers lie on the eastern edge of WRIA 20, abutting the Olympic Mountains and flow 21 miles and 12 miles long respectively. Both rivers flow in a westerly direction with a combined drainage area of about 72 square miles. Within the watershed, elevations range from about 100 to 3,750 feet, most high elevation ridge tops reaching over 3,000 feet. The Sitkum River flows into the South Fork Calawah which in turn meets the North Fork to form the Calawah River. The Calawah River flows into the Bogachiel which eventually meets the Sol Duc to form the Quillayute River. The Quillayute drains westerly into the Pacific Ocean.

1.4.3.3 Dickey Sub-Basin

The Dickey River is a major tributary of the Quillayute River system. The Dickey mainstem is 22.8 miles long with a drainage basin of 108 square miles. The majority of the basin lies below 440 feet in elevation with the ridge tops ranging from 1,200 to 1,400 feet in elevation. Much of the area is within 10 miles of the Pacific Ocean. These conditions lead to high precipitation with little incident of snow or rain-on-snow events, as well as high winds, a factor that can adversely affect riparian buffers.

The Dickey basin contains three major tributaries (East, West and Middle Dickey), two major creeks (Skunk and Thunder) and a large lake (Dickey). The river sub-basins are very different in character.

1.4.3.4 Sol Duc Sub-Basin

The Sol Duc watershed is located in the northeast corner of WRIA 20 and lies completely within Clallam County. The watershed is comprised of 20 sub-watersheds and drains approximately 219 square miles. The upper portion of the Sol Duc is high country (elevations above 5,000 feet) meadowland with many glacier lakes. These meadowlands drain into steeply incised headwater tributaries and form the rugged Upper and North Fork Sol Duc sub-watersheds. The mainstem gradually broadens below Sol Duc falls and then adopts a lower gradient channel configuration typical of flat valley bottoms. Within the valley lowland reach, Camp, Lake, Bear and Beaver Creeks are all major tributaries with Shuwah Creek to a lesser extent (R. Lien, personal communication). Lake Pleasant lies between Upper and Lower Lake Creek. Finally, 64.9 river miles from the headwaters, the Sol Duc and Bogachiel Rivers meet to form the Quillayute River, a Pacific Ocean tributary.

1.4.4 Sooes/Waatch Sub-Basin

The Sooes River originates in the foothills of the Olympic and flows through mostly Crown Pacific timberlands until it reaches the Makah reservation at river mile (RM) 4.2. The mainstem is approximately 16 miles long with about 39 miles of tributaries. The Waatch River is located entirely within the Makah reservation and there is very little published information on the river.